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VDS TOWLINE TESTER.(U)
APR 63 G V WILLIAMS
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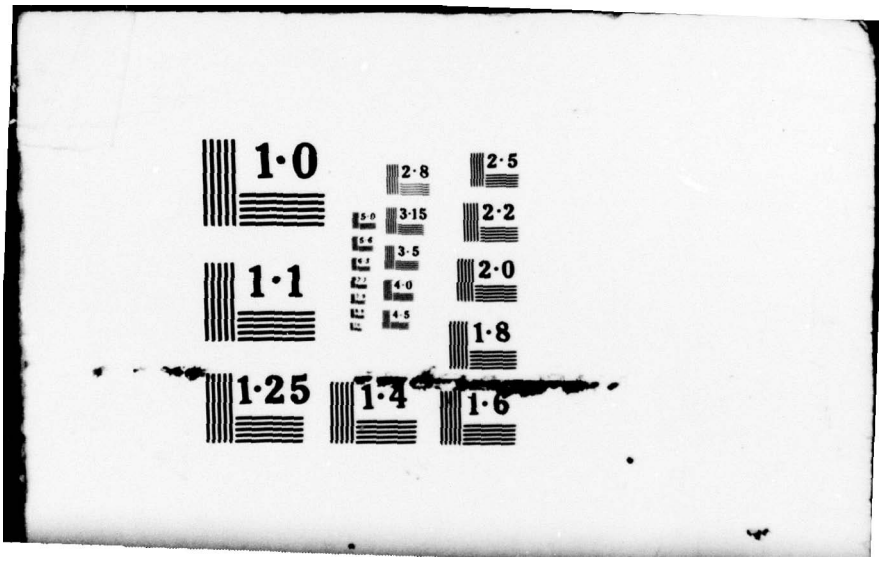
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(12) 13p.

U. S. NAVY UNDERWATER SOUND LABORATORY
FORT TRUMBULL, NEW LONDON, CONNECTICUT

USL Problem
No. 1-650-01-00

(9) Technical memo.

(6) VDS TOWLINE TESTER.

By

(10) Guy V./Williams

USL Technical Memorandum No. 933-105-63

(11) 25 Apr 1963

(14) USL-TM-933-105-63

ABSTRACT

MOST Project -4

INTRODUCTION

This memorandum discusses the design, operation, performance and maintenance of a VDS towline tester, available at USL, that is capable of testing VDS towlines and their components (1) so that towline developments can be guided by some of the realistic conditions encountered in the field and (2) so that towline serviceability can be examined prior to installation on a ship.

ABSTRACT

The towline tester was manufactured in accordance with a USL specification and procured by Contract N140-(70024)72261B that was awarded, in the amount of $22,000., to Western Gear Corporation, Seattle, Washington. Delivery to USL was made in May 1963; installation on the top of Fort Trumbull was completed in November 1962. To date, it has been used in testing the VDS minimum-width towline that USL is developing, and high-strength wire ropes that are being examined for minimum-width towline applications.

DISCUSSION

A VDS towed system requires a towline that serves as the coupling between the towed body and the hoist that launches, tows, and retrieves the towed body.

VDS towline developments are complicated by the fact that a streamlined fairing is required on the towline in order to reduce excessive drag and vibration. Hitherto, evaluation of fairings has depended totally upon the availability of sea test time on a ship, which cannot always be scheduled whenever required. Consequently, delays have occurred in towline developments.

Although sea tests are required to permit final analysis of a development, it is prudent to conduct several tests on shore so that failures during the sea tests might be reduced. Typical information should be available, prior to the sea tests, on:

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(1) service life of the towline due to simulated conditions of shipboard handling;

(2) behavior of towline fairing parts when handled by a winch or fairleader;

(3) abrasion problems of electrical cable and wire rope, if used, as they are in minimum-width towlines; and

(4) flexibility of electrical cables and wire ropes.

The towline tester serves the purpose in obtaining such information and permits data-gathering at an accelerated rate.

GENERAL DESCRIPTION

The towline tester (Figure 1) consists of two basic units: (1) the winch unit, which is capable of paying out and reeling in cables and towlines of sizes up to 1-3/4 inches in diameter and width, respectively, and (2) an idler-roller over which the towline is fairleaded.

Winch Unit

The winch (Figure 2) consists of a 30 HP AC electric motor, which drives a variable displacement hydraulic pump (Vickers Type PV-2012) through a Sier-Bath gear-type coupling. The high pressure hydraulic fluid is delivered by the pump to a motor (Vickers type MF-2020), which drives a gear reducer (Western Gear Mod. ODT 351:1 ratio), which, in turn, drives the cable drum. The drum (Figure 3) has a 50-inch outside diameter, a 62-inch diameter flange at each end, and a 20-inch width. A clamp is provided on the drum's outer flange to permit fastening the towline or wire rope.

A spring-loaded, multiple disc brake, which is hydraulically released, is located on the high-speed shaft of the gear reducer. A hand-operated band brake on the storage drum is also provided.

The control panel is located adjacent to the electric motor. This control panel contains the magnetic controller for the electric motor, the automatic cycle on-off switch, the electrically operated cycle counter, and three hydraulic fluid gages which indicate the high pressure, control pressure and replenishing pressure of the hydraulic system. The manual operating control is located adjacent to the Vickers hydraulic motor.

The electric motor, hydraulic pump and motor, gear reducer, storage drum, control panel, brakes and hydraulic fluid reservoir are mounted on a common foundation to form a packaged self-contained unit.

Idler-Roller Unit

The roller (Figures 4 and 5), over which the towline is fairleaded, consists of a drum whose dimensions are identical with that of the winch drum. (The elliptical sheave that is shown on the photographs was developed for VD hoist applications and is not a unit that is part of the idler-roller unit.) It is mounted on pedestal bearings, which are located at the end of a cantilevered counter-balanced I-beam foundation, which extends about six feet over the edge of the parapet on top of Fort Trumbull (See Figure 6). The distance between the winch drum and the idler-roller is about 22 feet. The vertical distance from the centerline of the roller to the ground is about 35 feet.

A 20,000-pound weight is provided to tension the towline or cable to be tested. This weight consists of eight 2500-pound steel sections so as to provide means for conducting tests with different loads. Provision is also made to keep this weight (and cable) from rotating and swinging as it is raised and lowered up and down, respectively.

PERFORMANCE

The winch is capable of developing a maximum drum speed of 30 FPM with a cable load of 20,000 pounds, or 20 FPM with a cable load of 30,000 pounds. A cam-operated limit switch, driven by the low-speed shaft of the gear reducer, enables the unit to automatically pay out and reel in 25 feet of cable at a rate of 20 FPM with a maximum cable loading of 20,000 pounds. Cables with loads between 20,000 and 30,000 pounds must be operated by "Manual Control" only. This rating is based on a 75% hydraulic pump stroke.

The hydraulic brake has been factory tested with a dynamic load of 30,000 pounds, and with a static load of 40,000 pounds. The hand-operated brake is for emergency use only.

Normal hydraulic working pressures are as follows:

(a) High pressure (Relief valve setting - 3000 psi)	1950 psi
(b) Control pressure	320 psi
(c) Replenishing pressure	100 psi

The cycle counter is provided with a manual reset. A complete cycle consists of raising and lowering (or vice versa) the weight once.

OPERATION

The following procedures should be followed to operate the towline tester:

Preliminary

(a) Close the main power switch in the fused switchbox, located on the concrete wall adjacent to the winch platform.

(b) Start the electric motor with the "AUTO-CYCLE" switch in the OFF position and the "MANUAL CONTROL" lever in the neutral (zero stroke) position. It is important that the hydraulic system be allowed to warm up, depending upon weather conditions, until the pressure of gages show the following "no load" readings:

(a) High Pressure - about 500 psi

(b) Control Pressure - about 290 psi

(c) Replenishing Pressure - about 90 psi

It is normal for the replenishing pressure to be slow in rising to the above pressure reading.

Manual

(a) To raise the weight, move the MANUAL CONTROL lever toward the winch drum.

(b) To lower the weight, move the MANUAL CONTROL lever away from the winch drum. The speed of the winch drum will increase as the MANUAL CONTROL lever is moved toward its extreme "raise" or "lower" position.

Automatic

(a) Allow the weight to come to rest in its lowered position, using MANUAL CONTROL.

(b) Return the MANUAL CONTROL lever to its neutral (zero stroke) position.

(c) Turn the AUTO-CYCLE switch to the ON Position.

(d) The unit may be returned to MANUAL CONTROL by turning the AUTO-CYCLE switch to the OFF position.

Securing

(a) Turn the AUTO-CYCLE switch to the OFF position.

(b) Using MANUAL CONTROL, allow the weight to come to rest in its extreme lowered position.

(c) Return the MANUAL CONTROL lever to the neutral (zero stroke) position.

(d) Stop the electric motor by pressing the STOP button on the Control Panel of the winch unit.

(e) Open the main power switch in the fused disconnect switchbox, located on the concrete wall adjacent to the winch platform.

For further detailed information, consult reference (a), "Instruction Book Electro-Hydraulic Towline Tester," M.I.B.-151, by Western Gear Corporation.

PERMANENT LOG BOOK

A permanent log should be kept covering each scheduled test. The following information should be recorded:

1. Date of test.
2. Weather conditions.
3. Names of personnel conducting test.
4. Identification of type of towline or cable.
5. Tensioning weight used.
6. Number of cycles, manual and auto-cycle.
7. Total running time.
8. Results of test.
9. Remarks on:
    a. Need for lubrication.
    b. Malfunction of winch unit.
    c. Overheating of hydraulic system.
    d. Other pertinent items.

SAFETY

A minimum of two people should work together as an operating team.

A portable sound-powered telephone link is provided for operational and emergent communication between the operator on the winch platform and the observer stationed on the ground adjacent to the tensioning weight. The sound-powered telephone link is required for two reasons: first, because the operator on the winch platform cannot see the observer who is stationed on the ground and secondly, due to the high noise level of the winch when in operation, normal communication is sometimes not possible.

Hard hats must be used by operating personnel, in accordance with current safety regulations.

Each piece of machinery has a noise level, which will become familiar to the operating personnel. A change in this noise level may be an indication of potential trouble.

Test personnel should at all times observe caution in the operation of this facility. A malfunction of the winch unit or a failure of the towline or cable under high tension can create an extremely hazardous situation.

Guy V. Williams

GUY V. WILLIAMS
Mechanical Engineer

List of References

(a) Instruction Book, Electro-Hydraulic Towline Tester, by Western Gear Corporation, Manufacturers Book No. M.I.B.-151, USL Accession No. 37617

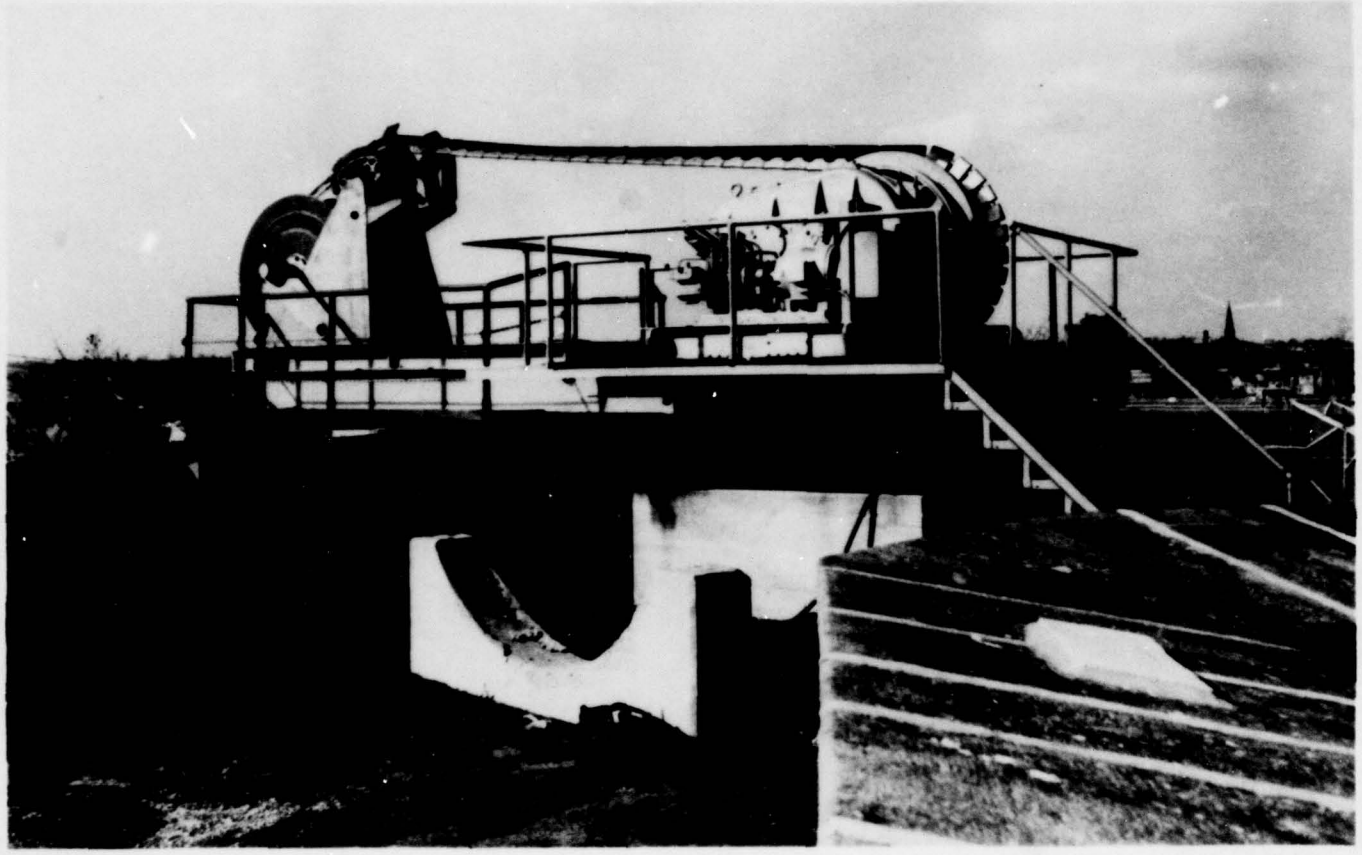

Fig. 1

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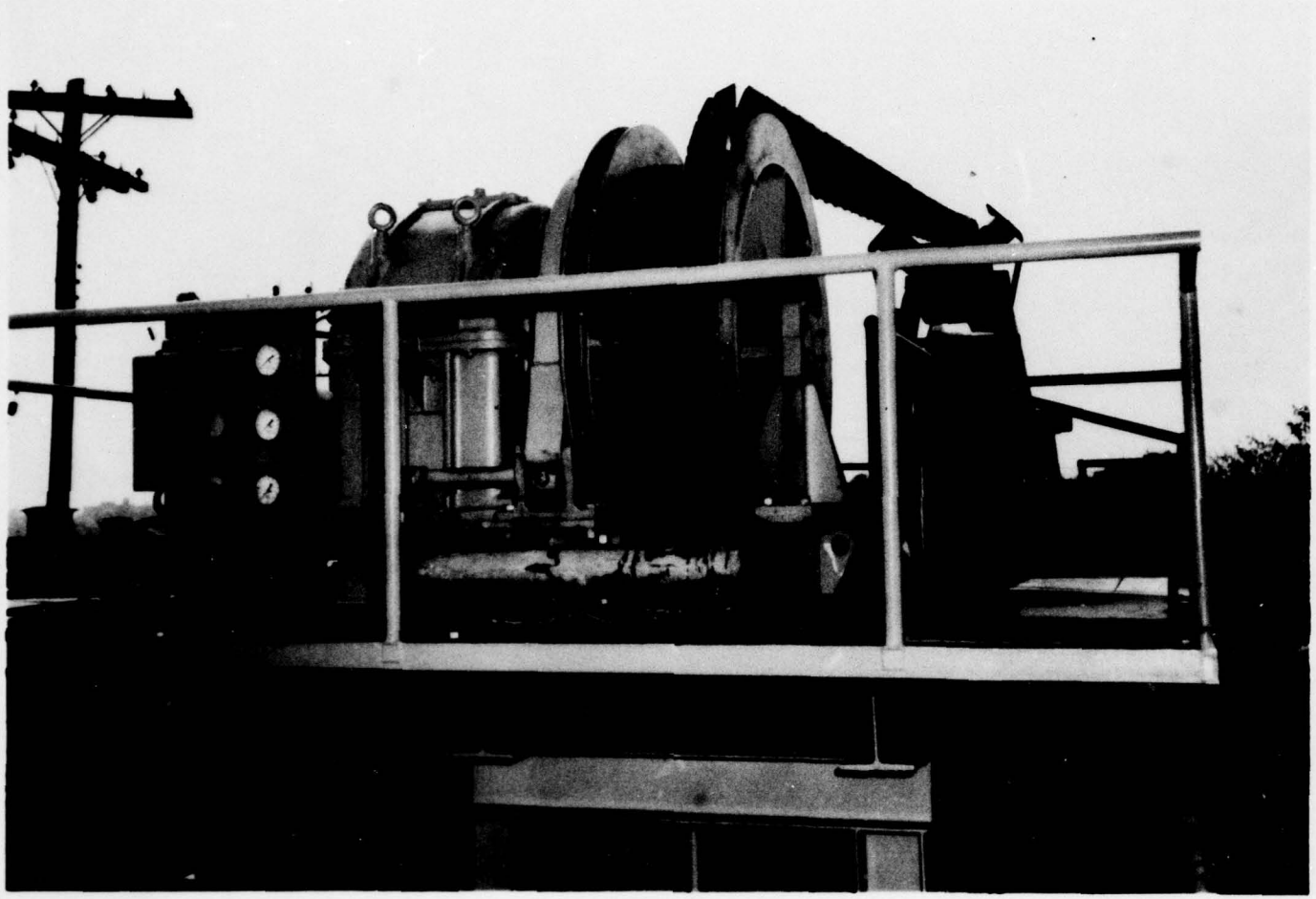

Fig. 2

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Fig. 3

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Fig. 4

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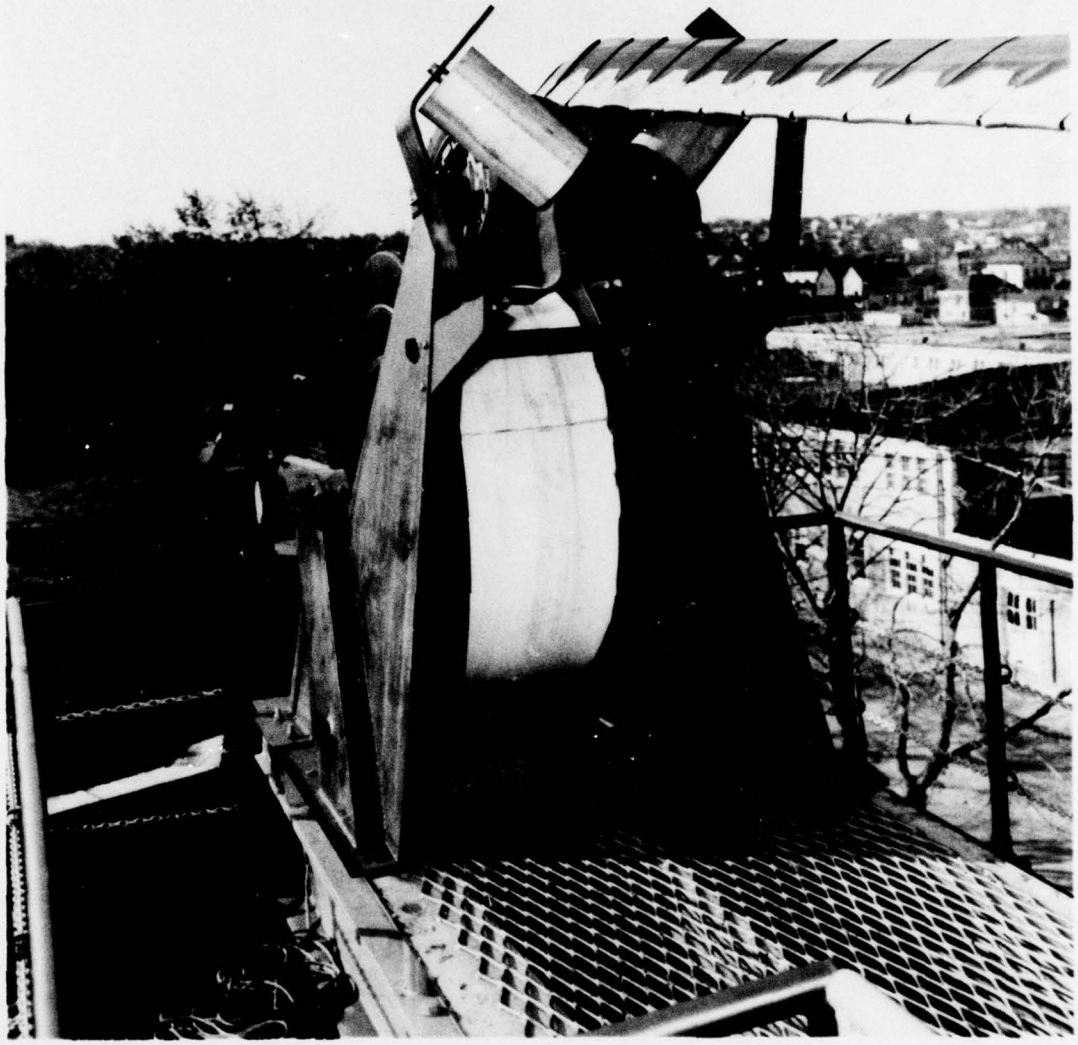

Fig. 5

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Fig. 6

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